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EXHIBIT "A"

THE DECLARATION OF ARUMUGAM MURUGANANDAM

JAN 14 2005

CURRICULUM VITAE
ARUMUGAM MURUGANANDAM, Ph.D., M.B.A.

DYAX CORP • 300 TECHNOLOGY SQUARE • CAMBRIDGE, MA, 02139 • 617-250-5767

Amuruganandam@Dyax.com

SUMMARY

Protein Biochemist with 14+ years experience in academic and corporate research environments, with interest to contribute to drug discovery and strategic research teams in biotech or pharmaceutical arenas. Core strengths include therapeutic macromolecular drug discovery, micro scale protein production and purification, target characterization, enzyme kinetics and assay development. Skilled in interfacing with multidisciplinary teams, collaborative partners, and contract organizations, along with providing training and leadership to associates. Recognized for initiative, an enthusiastic attitude and solid interpersonal, organizational and communication skills.

EXPERIENCE

DYAX CORPORATION, Cambridge, MA
Senior Scientist, Molecular Biology Research Division

2001 - Present

NATIONAL RESEARCH COUNCIL OF CANADA, Ottawa, ONT
Associate Research Officer: Institute for Biological Sciences
Assistant Research Officer: *Institute for Biological Sciences*

2000 - 2001

1995 - 2000

MOBIX, MCMASTER UNIVERSITY, Hamilton, Canada.
Post-Doctoral Fellow: Advisor: Dr. William J. Muller, Associate Professor.

1994 - 1995

UNIVERSITY OF WINDSOR, Windsor, Canada.

1990 - 1994

Graduate Research: *Dept. of Chem. & Biochem, Canada. Advisor: Dr. Bulent Mutus, Associate Dean.*

RELATED SKILLS

- Phage display technology, phage displayed peptide library construction, antibody engineering, *in vitro* and *in vivo* panning, gene cloning, protein expression, purification, enzyme analysis, HPLC, PCR applications.
- Biochemical, and molecular biology methodologies as applied to cell physiology including isolation of human non-neuronal cells (endothelial cell, astrocytes, oligodendrocytes and smooth muscle cells) transendothelial transport studies, histological studies, chromosome preparation, ploidy screening, membrane vesicle preparation and analysis.
- Practical experience with proteomics and genomics techniques including 2-D gels, subtractive hybridization and differential gene display.
- Recombinant DNA methodologies such as construction of knockout and conditional knockout vectors, site-directed mutagenesis etc.
- Anatomical and Surgical techniques (intra-aortic perfusion, dissection, *in vivo* titrating for phage, light microscopy etc).

PHAGE DISPLAYED FAB & PEPTIDE DISCOVERY PROGRAMS

- Leading an antagonist-antibody project towards developing a therapeutic antibody for treating autoimmune diseases.
- Contributed to eight diverse research initiatives spanning lead identification, lead purification, lead characterization and in assay development, while participating in all facets of drug discovery including research reviews, strategy sessions, steering committees and collaborative efforts.
- Supervised and trained scientists assisting with discovery and characterization of lead compounds, and actively contributed to selection of research team members.
- Maintaining a successful collaboration with a renowned academic professor of Oncology to discover a therapeutic antibody against a high-profile target through research programs.
- Teamed with Internal Cloning & Expression Group, to ensure the timely production of proteins, also contributed to cloning and expression efforts when necessary.
- Directed expression and purification of numerous FAB and IgG resulting in the high quality production, typically to more than 90% homogeneity.

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- Implemented and refined purification schemes for epitope-tagged and non-fusion proteins using FPLC and chromatography methods like precipitation, ion exchange, affinity and gel filtration.
- Developed protein production and modification, protein purification methods, which streamlined and increased the efficiency of purification processes.
- Oversaw modification and quality control of all purified targets, which included hintinylation, electrophoresis, Western blotting, spectral analysis and the establishment of functional or binding assays.
- Identified and maintained literature for active targets; distilled all relevant information in a database that served as a resource and reference for the group.
- Delivered research data and supported validation of lead compounds
- Authored in grant applications and published numerous papers and book chapters.

EDUCATION

Ph.D., Biochemistry, (1994), University of Windsor, Windsor, Ontario, Canada.
 M.A., Biology, (1989), Fisk University, Nashville, TN, U.S.A.
 M.B.A., Marketing & Advertising (1987), Annamalai University, India.
 B.Sc., Agriculture (1984), Annamalai University, India.

BOOK CHAPTER

1. Tanha, J. Muruganandam, A. and Stanimirovic, D. (2003) Phage-display technology for identifying specific antigens on brain endothelial cells. *Journals in Molecular Biology*, Humana Press. Methods Mol Med. 2003:89:435-49.

RESEARCH PUBLICATIONS

1. A. Shrivastava, M.A. Von Wronski, A.K.Sato, DT. Dransfield, D.Sexton, N. Bogdan, R. Pillai, P. Nanjappan, B. Song, B.Marinelli, D. DeOliveria, C.Lunenn, M. Devlin, A.Muruganandam, A. Abujoub, G. Connolly, Q. Wu, G. Conley, Q. Chang, M. Tweedle, R.C. Ladner, R. Swenson and A. Nunn. A strategy to generate high affinity peptide binders to RTK's. Submitted to *Cell* (2004).
2. A. Muruganandam, J. Tanha, S. Narang, and D. Stanimirovic (2002) Selection of phage-displayed llama single-domain antibodies that transigrate human blood-brain barrier endothelium. *FASEB J.* 16 (2) 240-2.
3. A. Muruganandam, J. Tanha, S. Narang, and D. Stanimirovic (2001) Selection of phage-displayed llama single-domain antibodies that transigrate human blood-brain barrier endothelium. *FASEB J.* (Epub).
4. Duvar, S., Suzuki, M., Muruganandam, A and Yu, R. (2000) Glycosphingolipid composition of a new immortalized human cerebromicrovascular endothelial cell line. *J.Neurochem*, 75(5) 1970-1976.
5. Muruganandam, A., Smith, C., Ball, R., Herring, T., and Stanimirovic, D. (2000) Glutathione homeostasis and leukotriene-induced permeability in human blood-brain barrier endothelial cells subjected to *in vitro* ischemia. *Acta Neurochirurgica*, 76:29-34.
6. Stanimirovic, D., Ball, R., Small, D.L., and Muruganandam, A. (1999) Developmental regulation of glutamate transporters and glutamine synthetase activity in astrocyte cultures differentiated *in vitro*. *Int. J. Dev. Neuroscience*. 17:173-184.
7. Muruganandam, A., Moorhouse, H. L., Monette, R., Durkin, J.P., and Stanimirovic, D.B. (1997) Development of immortalized human cerebromicrovascular endothelial cell line as an *in vitro* model of the human blood-brain barrier. *FASEB J.* 11:1187-1197.
8. Baldwin, J.S., Lee, L., Leung, T.K., Muruganandam, A., and Mutus, B. (1995) Identification of the Site of Non-enzymatic Glycation of Glutathione Peroxidase: Rationalization of the Glycation Related Catalytic Alterations on the basis of three-dimensional Protein Structure. *Biochim. Biophys. Acta*, 1247,60-64.
9. Muruganandam, A., and Gunasekaran, M. (1995) Partial purification and properties of Mg++ dependent ATPase from *Phymatotrichum omnivorum*. *Microbios*, 82, 233-243.

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10. Muruganandam, A. and Mutus, B. (1994) Isolation of Nitric Oxide Synthase from Human Platelets. *Biochim. Biophys. Acta*, 1200: 1-6.
11. Sexton, D.J., Muruganandam, A., McKarney, D.J. and Mutus, B. (1994) Visible Light Photochemical Release of Nitric Oxide from S-Nitrosoglutathione: Potential Photocchemotherapeutic Applications. *Photochem. Photobiol.*, 59:4, 463-467.
12. Muruganandam, A., Tannous, M. and Mutus, B. (1994) Enzyme linked immunosorbent assay for in vivo assessment of nonenzymatically glycated platelet glutathione peroxidase. *Clin Biochem*, 27:4, 293-298.
13. Muruganandam, A., Romsa, G.J., Thibert, R.J., Cheung, R.M-C., Draisy, T.F. and Mutus, B. (1993) Glycated Calmodulin from Platelets as an index of Glycemic control. *Clinical Chemistry*, 39/5, 815-819.
14. Starcevic, S.L., Muruganandam, A., Mutus, B. and Zielinski, B. (1993) Glutathione in the Olfactory Mucosa of Rainbow Trout (*Oncorhynchus mykiss*). *Chemical Senses*, 18: 57-60.
15. Muruganandam, A., Drouillard, C., Thibert, R.J., Cheung, R.M-C., Draisy, T.F. and Mutus, B. (1992) Glutathione Metabolic Enzyme Activities in Diabetic Platelets as a function of Glycemic Control. *Thrombosis Research*, 67: 385-397.

MANUSCRIPTS IN PREPARATION

1. Muruganandam, A., Ball, R., Moorhouse H. L., and Stanimirovic, D. Establishment of Rat microvascular endothelial and Astrocyte Cell Lines for use in allogenic *in vitro* Co-Culture Model of the Blood Brain Barrier. (Will be submitted when publication ban is lifted by the European Commission for Validation of Alternative Methods (ECVAM).

NRC INVENTION REPORT, FORM 1A

1. Inventors: Muruganandam, A., Tanha J., Narang S., and Stanimirovic, D. (1999) Development of single domain antibodies against the human blood-brain barrier antigens.
2. Inventors: Muruganandam, A., Ball, R., and Stanimirovic, D. (1998) Immortalized Endothelial Cell Line from Human Plal Arteries (PEC) and its use in In Vitro Model of the Blood-Brain Barrier".

PUBLISHED ABSTRACTS

1. Sato, A., Devlin, M., Sexton, J., Ladner R., Muruganandam, A., Abujoub, A., Connelley, G., Wu, Q., Conley, G., Chang, Q., Shrivastava, A., Von Wronski, M., Nunn, A., Tweedle, M., Swenson, R., Bogdan, N and Pillai, R. (2004) Peptide Phage Display to Identify a Potent Heterodimeric Antagonist of VEGF-R2. *9th Naples Workshop. Peptides as therapeutics, diagnostics and Vaccines. Anacapri, Italy.*
2. Muruganandam, A., Tanha J., Narang S., and Stanimirovic, D. (2002) Single domain antibodies as vectors for brain drug delivery. *Gordon Research Conference, Tilton, NH.*
3. Ball, R., Muruganandam, A., and Stanimirovic, D. (2002) Characterization of the *in vitro* BBB model based on immortalized rat cerebromicrovascular endothelial cells: *ECVAM Study.*
4. Muruganandam, A., Tanha J., Narang S., and Stanimirovic, D. (2001) Selection and purification of llama single domain antibodies with high affinity to human blood-brain barrier antigens. *IV International Conference of Cerebral Vascular Biology, Cambridge, UK, 2001.*
5. Muruganandam, A., Tanha J., Narang S., and Stanimirovic, D. (2000) Identifying novel antibodies with potential to mediate transvascular drug delivery to the human brain using phage display approach. *Antibody Engineering, San Diego.*
6. Muruganandam, A., Tanha J., Narang S., and Stanimirovic, D. (2000) Selection and purification of llama single domain antibodies with high affinity to human blood-brain barrier antigens. *44th OHOLE conference on Blood-brain barrier.*
7. Zhang, W., Muruganandam, A., Roberts, H., Hamel, E., and Stanimirovic, D. (1999) The expression and functional properties of multidrug resistance transporters in cerebral endothelial cells and astrocytes. *Society for Neuroscience Abstracts*: 1760.

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8. Muruganandam, A., Ball, R., and Stanimirovic, D. (1999) *In vitro* ischemia induced changes in glutamate transporter expression and glutamate uptake in fetal human astrocytes. *J. Neurochem.* 72: S55.
9. Cobca, Z., Muruganandam, A., Ball, R., Durkin, J., and Stanimirovic, D. (1998) Proliferative and angiogenic properties of immortalized human cerebromicrovascular endothelial cells. *Soc. Neurosci. Abstr.* 24:521.9.
10. Muruganandam, A., Morley, P., Smith, C., and Stanimirovic, D. (1998) Expression of blood brain barrier markers, and functional characterization of immortalized human brain endothelial cells. *Cerebral Vascular Biology* 98:106.
11. Zhang, W., Shapiro, A., Herx, L.M., Muruganandam, A., and Stanimirovic, D. (1998) Effects of cytokines and *in vitro* ischemia on the expression and secretion of chemokines IL-8 and MCP-1 by cultured human brain endothelial cells. *Cerebral Vascular Biology* 98: 307.
12. Ball, R., Muruganandam, A., Small, D., Stanimirovic, D. (1998) Developmental regulation of glutamate transporters and glutamate synthase activity in astrocyte cultures differentiated *in vitro*. *J. Neurochem.* 70: S68.
13. Ball, R., Monette, R., Muruganandam, A., Small, D., Morley, P., and Stanimirovic, D. (1997) Receptor-mediated endocytosis in primary and immortalized human brain microvascular endothelial cells. *Soc. Neurosci. Abstr.* 23:2267.
14. Muruganandam, A., Ball, R., Herx, L.M., Durkin, J.P., and Stanimirovic, D.B. (1997) Development of immortalized human brain cell lines applicable to an *in vitro* model of the blood-brain barrier. *The FASEB J.* 11 (9):A1113.
15. Leung, T.K., Muruganandam, A., Lee, L. and Mutus, B. (1993) Identification of the Site of Nonenzymatic Glycation of Glutathione Peroxidase: Rationalization of the Glycation Related Catalytic Alterations on the basis of 3-D Protein Structure. *Protein structure and Function: A Nalbandov-Beckman Institute symposium*. Urbana-Champaign, Ill.16.
16. Mutus, B. and Muruganandam, A. (1993) Purification of Nitric Oxide Synthase from Platelets. *Proc. Can. Fed. Bio. Soc.* 244, 89.
17. Muruganandam, A., Leung, T. K. and Mutus, B. (1992) Evidence for Nonenzymatic Glycosylation of Glutathione Peroxidase. *Proc. Can. Fed. Bio. Soc.*, 265, 87.
18. Starcevic, S.L., Muruganandam, A., Mutus, B. and Zielinski, B. (1992) Localization and Quantification of Glutathione in the Olfactory System of the Rainbow Trout. *Proc. Can. Fed. Bio. Soc.*, 266, 87.
19. Muruganandam, A., Cheung, R.M.-C., Draiczy, T.F., Thibert, R.J. and Mutus, B. (1991) Glutathione Metabolic Enzyme Activities in Diabetic Platelets as a function of Glycemic Control. *Proc. 9th Intl. Conf. on Atherosclerosis*, 22, 302.
20. Starcevic, S.L., Muruganandam, A., Mutus, B. and Zielinski, B. (1991) The Use of Monobromobimane to study Glutathione in the Rainbow Trout Olfactory Organs. *Proc. Achems XIII*. 216, 586.

ORAL PRESENTATION

1. Muruganandam, A., and D. Stanimirovic. (1999) Immortal brain cells: a technology platform to develop strategies to treat CNS disorders. *Bioventure Ontario 99*, Toronto, June 1999.
2. Muruganandam, A., Morley, P., Smith, C., and Stanimirovic, D. (1998) Expression of blood-brain barrier markers, and functional characterization of immortalized human brain endothelial cells. *Cerebral Vascular Biology* 98:106.
3. Zhang, W., Shapiro, A., Herx, L.M., Muruganandam, A., and Stanimirovic, D. (1998) Effects of cytokines and *in vitro* ischemia on the expression and secretion of chemokines IL-8 and MCP-1 by cultured human brain endothelial cells. *Cerebral Vascular Biology* 98: 307.

INVITED LECTURES

- * Department of Chemistry and Biochemistry, University of Windsor, 2000.
- * Faculty of Agriculture, Annamalai University, India, 1997.
- * Department of Biochemistry, Annamalai University, India, 1995.

FELLOWSHIP AND AWARDS

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1990-93 University of Windsor Fee Differential Scholarship.
1992 & 93 William A.Redmond Memorial Bursary.
1987-89 Fisk University Tuition Fee Scholarship.
1982-83 Dr.G.Rangaswamy prize for Agricultural Microbiology.

PROFESSIONAL AFFILIATIONS

AMERICAN ASSOCIATION FOR CLINICAL CHEMISTRY
AMERICAN ASSOCIATION FOR ADVANCEMENT OF SCIENCE
AMERICAN SOCIETY OF MICROBIOLOGY

This is Exhibit "A" to the Declaration of Arumugam Muruganandam. I hereby declare that all statements are made of my own knowledge, are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both under § 1001 of Title 18 of the United States Code, and that such willful statements may jeopardize the validity of the application or any patent issued therefrom.

1/13/05
Date

A. Muruganandam
Arumugam Muruganandam

Witness Signature [Signature]

Witness Name Printed Dan Sexton Date 01/13/05